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Halley's Spin State Determined . . . . . M. J. S. Belton

Since the VEGA and GIOTTO flybys of comet Halley in 1986 there has been a rising controversy over the nature of the spin state of its nucleus. So far, some 8 different models have been published but none as yet has been shown to simultaneously satisfy both spacecraft and ground-based data. Resolution of this problem is important because the future interpretation of much of the data archived by the *International Halley Watch* will depend on the existence of an accurate spin ephemeris.

The problem has now been resolved by M.J.S. Belton, W.H. Julian, A. Jay Anderson and B.E.A. Mueller who have found a spin state that simultaneously satisfies the VEGA and GIOTTO imaging data and a wide range of ground-based data. The latter includes photometric time-series taken both pre- and post-perihelion passage, time-series images of CN-jets emanating from the nucleus, and an extended episode of production of CN-shells that were seen to propagate through the coma. The total spin vector is not fixed in the nucleus but is inclined to the total angular momentum vector at an average angle of 21.4 degrees and precesses around it with an average period of 3.69 days. The average period associated with the total spin vector is 2.84 days, but neither this period or the inclination is constant in time. This spin state results in the return of the Sun to a position over particular areas of the nucleus every 7.4 days as required by the ground-based observations.

This solution has also allowed the first reasonably accurate maps of the locations of active areas on the nucleus to be drawn. There are five important areas of activity and one of these appears to have either chemical or physical properties that are different from the rest. This area appears to be active at very large heliocentric distances and to be solely responsible for the production of CN-shells. A further consequence of the model is that the interior density distribution in the nucleus is constrained to emulate that of a roughly homogeneous distribution.

The reason why it has taken so long to achieve a satisfactory model is that the direction of the long-axis of the nucleus in the original interpretation of the VEGA 1 pictures was assumed to be the reverse from what is actually the case.

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